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EXAMINER	
TUROCY, DAVID P	

ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
12/04/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/679,764	**Applicant(s)** JANGJIAN ET AL.	
	Examiner DAVID TUROCY	**Art Unit** 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 October 2008*.
2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-12,14 and 15* is/are pending in the application.
 4a) Of the above claim(s) *5 and 6* is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1,3,4,7-12,14 and 15* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a)☐ All b)☐ Some * c)☐ None of:
  1.☐ Certified copies of the priority documents have been received.
  2.☐ Certified copies of the priority documents have been received in Application No. _____.
  3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
 Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Species A in the reply filed on 12/3/2007 is acknowledged.

Response to Amendment

2. Applicant's amendment, filed 10/27/2008, has been fully considered and reviewed by the examiner. The examiner notes the amendment to claim 1, 9, 11, and 14, and the cancellation of claim 2. In view of the amendment to claim 9 and 14, the examiner has withdrawn the claim objection. Additionally, in view of the cancellation of the claims, the examiner has withdrawn the double patenting rejection as set forth in the prior office action. In view of the amendment to the specification and thus the objection to such as been withdrawn. Claims 1, 3-12, 14 and 15 remain pending in the instant application with claims 4 and 5 withdrawn due to a restriction requirement.

Response to Arguments

3. Applicant's arguments filed 6/4/2008 have been fully considered but they are not persuasive.

The applicant has argued against the 35 USC 112 1st paragraph rejection, arguing that that the specification clearly enables for other fluorine containing gas having the abilities of etching back the low-k dielectric layer as well as reacting with said process gas. However, the examiner disagrees, specifically for the reasons set forth in the rejection below. Additionally, the applicant's arguments are directed at the particular issue with regards to the enablement of the specification. Specifically, it would require undue experimentation, in view of the teachings of the specification to determine the scope of the claims, including which gases provide the benefits as claimed by the applicant. The undue experimentation would encompass determining which fluorine reactant gases, selected from a seemingly infinite number of possibilities, effectively and successfully etch back the deposited low-k layer and also deposits another dielectric layer with the additional element as required by the present claims. See *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). The applicants argue that persons skilled in the art, while reading the specification, would have understood that other fluorine gases have the abilities as claimed, however, the examiner notes that such is mere conjecture unsupported by any factual evidence. Specifically, as discussed below, the specification fails to include any working examples or direction as to a representative number of species of the infinite number of possible fluorine reactant gases, which would result the etch back and deposition as required by the claim.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The applicant has argued against the combination of MacNeil in view of Zhang, arguing that Zhang clearly reveals their unawareness of etching back the low-k dielectric layer. The examiner notes that the applicant is arguing that the etch back using NF_3 is unexpected. However, the examiner disagrees, notes US Patent 5807786, at column 3, and US Patent 6235644, at column 1, lines 60-68 each discloses that supplying NF_3 results in etching back and therefore the fact that NF_3 etches back is not unexpected results. Additionally, the applicant argues that Zhang fails to be aware of the etch back process, however, the fact that Zhang does not acknowledge the etch back process does not mean that such does not exist. Specifically, MacNeil in view of Zhang discloses all the process steps as claimed by the applicant, see claim 1, and therefore the process of MacNeil in view of Zhang must necessarily result in etching back the low-k dielectric layer, i.e. NF_3 is supplied to the process chamber and therefore there must be some degree of etch back unless the applicant is doing other process steps that are not presently claimed. Additionally, MacNeil in view of Zhang teaches each and every process step and limitation of the applicant's claims, includingsupplying NF_3 to the chamber in situ. Since the etching back of the layer is simply a function of the gases supplied, and the combination of the MacNeil in view of Zhang teaches the claimed process steps, the process of the combination of the MacNeil in view of Zhang would have inherently etch back the layer unless essential process steps and/or limitations are missing from the applicant's claims.

The applicant argues against the Zhang reference stating that the reference teaches SiF_4 as a gas, however, the examiner maintains that Zhang discloses providing a process gas to provide nitrogen into a dielectric layer, discloses N_2 and NF_3 are known substitutes for providing nitrogen into the layer and such a substitution would have predictably yielded nitrogen into the layer (Column 2, lines 55-60).

In response to the applicant's arguments with regards to MacNiel regarding the ratio of gases, the examiner notes that MacNiel discloses a nitrogen flow ratio within the range as claimed, and therefore the combination of references would reasonably lead to predictable results. Additionally, as previous discussed, at the very least, MacNiel discloses supplying the gases in various flow rate ratios result in the deposited layer and the properties associated therein (0026) and therefore, MacNeil clearly discloses adjusting the gas flow, including ratio, is a known result effective variable. It would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the gas supply ratio used in the process of MacNeil in view of Zhang, through routine experimentation, to impart the deposited layer with the desired properties.

All other applicants' arguments, that are not addressed above, are deemed moot because they are unsupported by any factual evidence and are therefore deemed mere attorney speculation.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1, 7-10, 11, 14, and 15 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for supplying NF_3 gas (or the non-elected C_xF_x gas) as the reactant gas, does not reasonably provide enablement for any number of infinite number of fluorine reactant gases in situ. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims.

6. The nature of the invention involves application of a low-k dielectric layer and then in situ introducing a reactant gas, selected from an infinite number of possible layers, to etch back and deposit another dielectric layer containing an extra element provided by the reactant gas. The state of the prior art is silent to various fluorine reactant gases that are capable of etching back and depositing a layer of dielectric with an extra element in such a manner and while the skill of one ordinary in the art is relatively high, the claims required a chemical reactions and deposition of coatings which is a highly exact science. Additionally, while the specification clearly describes with sufficient specificity the use of NF_3 results in etching back a low-k film and additionally deposits a dielectric layer with a nitrogen compound, the specification fails to include any working examples or direction as to a representative number of species of the infinite number of possible fluorine reactant gases, which would result the etch back and deposition as required by the claim. This undue experimentation would encompass determining which fluorine reactant gases, selected from a seemingly infinite number of possibilities etch back the deposited low-k layer and also deposits

another dielectric layer with additional element as required by the present claims. See *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1, 3, 7, 8, 9, 11, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (US Patent Publication 2001/0030369 A1) in view of Zhang et al. (US Patent 6468927 B1).

These claims are rejected for the same reasons as set forth in the office action dated 3/4/2008 and for the reasons set forth in paragraph 3 above.

9. Claims 4 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (US Patent Publication 2001/0030369 A1) in view of Zhang et al. (US Patent 6468927 B1) and further in view of the ASA (The admitted state of the art as disclosed by the applicant)

These claims are rejected for the same reasons as set forth in the office action dated 3/4/2008 and for the reasons set forth in paragraph 3 above.

10. Claims 9, 10, 14, and 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacNeil et al. (US Patent Publication 2001/0030369 A1) in view of Zhang et al. (US Patent 6468927 B1) and further in view of O'Neill et al. (US Patent 6716770 B2).

These claims are rejected for the same reasons as set forth in the office action dated 3/4/2008 and for the reasons set forth in paragraph 3 above.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID TUROCY whose telephone number is (571)272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David Turocy/
Patent Examiner, Art Unit 1792

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1792